

Geohazard Supersites Phase-2: Selection of candidate Supersites

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July 6 2012

under development: version 0.3 by FA - to be revised pending community input

Executive Summary

The DLR granted TerraSAR-X background acquisitions to advance the Geohazards Supersites and Natural Laboratories. The task for the Scientific Advisory Committee (SAC) is to select sites (candidate Supersites) with the potential to become permanent geohazard Supersites in the future. This document summarized proposed candidate Supersites and proposes a rating mechanism according to the scientific potential, vulnerability and the relevance for the Global Earth Observation System of Systems (GEOSS). The well-rated sites will be imaged with TerraSAR-X depending on the quota available. For the highest-rated sites the SAC will request from CEOS data provision in order to advance GEOSS.

Committees

The following committees are responsible for details of the selection of candidate Supersites and event Supersites.

Earthquake committee: E. Fielding, S. Stramondo, M. Motagh,

Volcano Committee: J. Biggs, J. Pallister, T. Walter, E. Sansosti, M Pritchard

Tectonics Committee: T. Wright, A. Hooper

Notes

1. Revision of original Supersites. Some of the initial Supersites are working very well while others are inactive. It is proposed to gradually replace the non-active Supersites by sites that are of interest to a wider community. At the same time image coverage should be adjusted to better address the geophysical process under investigation. The Istanbul Supersite has already been extended to a Turkey Supersites with TerraSAR-X coverage of 4 sites along the North Anatolian Fault. Proposed changes are (1) to extend the Los Angeles Supersite to a San Andreas fault Supersite (including locations in Northern California) and (2) to add an Iceland Supersite in support of the EU-funded European Supersite project.

2. Building GEOSS. In an ideal world all monitoring agencies are participating in GEOSS and space agency resources would be allocated according to criteria (2) and (3) below. However, in the current reality many in-situ data networks are not yet part of GEOSS and not openly available. Thus, GEO should use SAR data as an incentive to attract broader participation in GEOSS. The SAC will request from CEOS data provision for the highest-rated candidate Supersites to advance the building of GEOSS.

Selection of potential future Supersites

Potential Supersites will be selected according to three criteria.

- 1) *GEOSS commitment of local monitoring agency.* This includes (i) the willingness to contribute in-situ data to GEOSS, (ii) the likelihood that the data and data products will flow into geohazard assessment, and (iii) efficient communication with task leadership (e.g. articulating data requirement, providing feedback about satellite data use in particular for crisis situations, etc).
- 2) *Vulnerability of population.* As laied out in the original White Paper, geohazard sites with significant populations exposed to geohazards are of higher relevance than unpopulated areas.
- 3) *Potential for new scientific results.* Sites with a high likelihood for new scientific results are of higher relevance because we need to demonstrate to CEOS that the satellite resources are well used.
- 4) *Geographical distribution.* We aim for 1 or 2 Supersites for each country of each proposed natural laboratory.

Proposed rating. We propose to rate the sites according to the three criteria. For each site a total of 10 points is available: 4 for the GEOSS involvement, 3 for the potential of new scientific results, and 3 for vulnerability. Higher numbers indicate better rating. For GEOSS commitment points are given for the provision of information (1 pt for returning the questionnaire) and for the contribution of seismic and GPS data (3 pts).

Data provision (Falk's idea). No agreements or committments about data provision has been made, except that CEOS is committed to advance GEOSS. The SAC should request the data provision for 10 sites that receive maximum rating. Rewarding participating organizations will advance GEOSS.

Table 1: Potential Volcano and Tectonics Supersites and rating. (red: background acquisitions started)

Location	Natural Laboratory	GEOSS involvement of monitoring agency ^x (4 pts)	Science potential* (3 pts)	Vulnerability of population* (3 pts)	Rating ^s (sum: 10 pts)
Americas					
Santiago, D.R. ¹	Caribbean	n/a	3	3	10
Montserrat ²	Caribbean	1	3	3	7
Telica, Cerro Negro, Nicaragua ^{3x}	Central America	?	3	3	6
Arenal ⁴	Central America	1	3	3	7
Galeras, Colombia ⁵	Northern Andes	4	3	3	10
Tungurahua, Ecuador ⁶	Northern Andes	4	3	3	10
tbd, Peru ⁷	Northern Andes				
Galapagos, Ecuador ⁸	Oceanic Islands	2	3	1	6
Lascar, Chile ⁹	Southern and Central Andes	?	3	2	5
Lastaria, Lazufre, Chile ¹⁰	Southern and	1	3	1	5

Central Andes					
Laguna del Maule, Chile ¹¹	Southern and Central Andes	?	3	2	5
Colima, Mexico ¹²	Mexico	?	1	3	4
Popocatepetl, Mexico ¹³	Mexico	?	2	3	5
Yellowstone ^x	Western North America	4	2	0	6
Katmai ^x	Alaska	4	2	0	6
Cleveland ^x	Aleutians	4	2	0	6

Europe, Africa

Santorini ¹⁴	Europe	3?	3	3	9
El Hierro ^{16,x}	Europe	2	1	2	5
Nabbro, Eritrea ¹⁷	East Africa	1	3	2	6
Nyriagongo, Nyamuragira, DRC¹⁸	East Africa	1	3	3	7
Alutu, Ethiopia ¹⁹	East Africa	1	3	3	7
Dabbahu, Ethiopia ¹⁹	East Africa	1	3	2	6
Ol Doinyo Lengai, Tanzania ²⁰	East Africa	0	3	2	5
Longonot, Kenya ^{20a}	East Africa	0	2	3	5
Piton de la Fournaise ^{20b,x}	Ocean Island	?	3	2	6

Asia, Oceania

Agung, Indonesia²¹	Southeast Asia	1	3	3	
Merapi, Indonesia ^{22,x}	Southeast Asia	?	3	3	6
Sinabung, Indonesia ^{23,x}	Southeast Asia	1	3	3	7
Kanlaon, Philippines^{24,x}	Southeast Asia	1	3	3	7
?, Papua N.G ²⁵	Southeast Asia	2	3	3	
Karymski, Russia ²⁶	North Pacific	?	2	3	5
Bezymianny, Russia ²⁷	North Pacific	?	2	3	5
Mt Fuji ²⁸	Japan	2?	2	3	7
Sakurajiima²⁸	Japan	2?	3	3	8
Krishima ³⁰	Japan	2	3	2	7

Explanation:

- (x) 1 pt for providing information (questionnaire returned) and up to 3 pts for the contribution of GPS and seismic data.
- (*) 0-3 pts with higher numbers indicating higher scientific potential and vulnerability.

Additional information for each volcano

- (X) Ad-hoc rating by FA because of lacking information
- (1) This site was selected already following the 2010 Haiti earthquake. Background acquisitions are underway
- (2) Montserrat. Some GPS data are already in Unavco (NSF-funded). MVO data not yet. MVO has expressed interest but questionnaire has not yet been returned. (rated by FA)
- (3) Both volcanoes are on one frame. Some data (NSF-funded) are in Unavco but local data not yet. Peter la Femina will contact local monitoring agency. (? , FA will ask Peter La Femina if needed)
- (4) Arenal: Juliet and FA will contact monitoring agency.
- (5) The Colombian Geological Survey (INGEOMINAS) filled out questionnaire and is interested in participating in data sharing pilots. Juliet or FA will contact Pasto observatory re in-situ data.
- (6) Ecuador: Instituto Geofisico (IG) filled out questionnaire and will provide GPS data into UNAVCO
- (7) Peru: Contacted E. Norabuena but did not hear back yet.
- (8) Galapagos: Rated 2 for GEOSS commitment because GPS data are in Unavco. and seismic data in IRIS. IG plans to install a seismic network in 9/2012. If this happens and data will be available (it is planned) then it should be rated 4. (rated by FA)
- (9) Chile: Lascar. The most active volcano in Central Andes. Excellent coherence. Rating by MP.
- (10) Chile: Lastaria and Lazufre: rated 1 for vulnerability because of ash hazard and 1 for GOESS commitment because NSF-funded data are open access. (FA's idea: should be rated 2 if French and GFZ data are available, 3 if we get the questionnaire and 4 if Chilean data is available)

(MP: There have been several ground measurements made in the Lastarria/Lazufre region. There have been campaign gravity and GPS observations by IRD and University Blaise Pascal, Clermont-Ferrand. Seismic and campaign GPS measurements have been made by GFZ and Universidad de Chile. As part of an NSF funded PLUTONS project, there are now 3 continuous GPS stations, campaign GPS observations, and a seismic network of 9 seismometers that will be deployed for 2 years. TSX measurements may only be necessary every few months. However, measurements spanning a large region are necessary to capture the entire deformation pattern.)

- (11) Chile: Laguna del Maule rated 2 for vulnerability (a dam may be affected by volcanic activity). (rated by MP)
- (12) Colima. Imaged through 2012 by GFZ with Spotlight. Observations should be continued

after project ends. Need to contact University of Colima, Cenapred for questionnaire. (rated by T Walter, T Walter will contact Gabriel Reyes re. questionnaire. FA can ask Nick Varley if no response)

- (12) Popo: rating by T Walter.
- (14) Santorini. JB has coverage through 2012 when project ends. Should get the highest priority because of current crisis. Rating by JB.
- (16) El Hierro. Rating by T Walter.
- (17) Nabbro: Rated by T Wright
- (18) Nyriagongo: Goma Volcano Observatory informed by Nicolas D'Oreye.
- (19) Rated by J Biggs - there is no dedicated volcano observatory or in-country monitoring equipment, but we have good colleagues at the University of Addis Ababa.
- (20) Rated by J Biggs.
- (20a) Rated by J Biggs. 3 volcanoes very close together: Longonot, Suswa and Olkaria. Might be possible to get all 3 in a stripmap image.
- (20b) Piton de la Fournaise: Who could contact IPGP and rate this?
- (21) Agung. GEOSS commitment: Will the data of the USGS GPS network be open access? FA's idea: If yes we should rate it 2. If Indonesians fill out questionnaire it will be rated 3, if they express interest in making seismic data available (delay is fine) it should be rated 4. (CVGHM was informed by J. Pallister).
- (22) Merapi: Rated by T Walter.
- (23) Sinabung (or other). CVGHM was informed by J. Pallister.
- (24) Kanlaon: Was suggested by Philippino graduate student Narod Eco (this gives rating 1). Philvolcs was contacted but questionnaire not returned. Can somebody contact Chris Newhall? FA can do it if needed.
- (25)
- (26) Karymski: Rating by T Walter
- (26) Bezymianny. Rated by T Walter
- (27) Rating by Y. Fukushima and Y Aoke
- (28) Rating by Y. Fukushima and Y Aoke
- (29) Rating by Y. Fukushima and Y Aoke